**SAVEETHA SCHOOL OF ENGINEERING**

**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES**

**DEPARTMENT OF DATA SCIENCE**

**BRANCH                 :   CSE, IT, AI&DS, AI&ML**

**COURSE CODE :  DSA01**

**COURSE NAME : OBJECT ORIENTED PROGRAMMING WITH C++**

**DAY 1 - LAB QUESTIONS**

|  | **Develop** a program to check the entered user name is valid or not. Get both the inputs from the user.  **Sample Input:**  Enter the user name: Saveetha@789  Reenter the user name: Saveetha@123  **Sample Output:**  User name is Invalid |
| --- | --- |
|  | **Identify** the Mth maximum number and Nth minimum number in an array and then find the sum of it and difference of it.  **Sample Input:**  Array of elements = {14, 16, 87, 36, 25, 89, 34}  M = 1  N = 3  **Sample Output:**  1stMaximum Number = 89  3rdMinimum Number = 25  Sum = 114  Difference = 64  Test cases:   1. {16, 16, 16 16, 16}, M = 0, N = 1 2. {0, 0, 0, 0}, M = 1, N = 2 3. {-12, -78, -35, -42, -85}, M = 3 , N = 3 4. {15, 19, 34, 56, 12}, M = 6 , N = 3 5. {85, 45, 65, 75, 95}, M = 5 , N = 7 |
|  | **Build** a program to reverse a number using loop?(Get the input from user)  **Sample Input:**  Number: 14567  **Sample Output:**  Reverse Number: 76541  **Test cases:**   1. -45721 2. 000 3. AD1947 4. !@#$% 5. 145\*999=144855 |
|  | **Develop** a program to find whether the person is eligible for vote or not. And if that particular person is not eligible, then print how many years are left to be eligible.  **Sample Input:**  Enter your age:  7  **Sample output:**  You are allowed to vote after 11 years  **Test cases:**   1. 25 2. Eighteen 3. 12 4. -18 5. 34.5 |
|  | **Develop** a program using choice to check  **Case 1:** Given string is palindrome or not  **Case 2:** Given number is palindrome or not  **Sample Input:**  Case = 1  String = MADAM  **Sample Output:**  Palindrome  **Test cases:**   1. MONEY 2. 5678765 3. MALAY12321ALAM 4. MALAYALAM 5. 1234.4321 |
|  | **Develop** a program to print Right Triangle Star Pattern  Sample Input:: n = 5  **Output:**  \*  \* \*  \* \* \*  \* \* \* \*  \* \* \* \* \* |
|  | **Develop** a program to print the below pattern?   |  |  |  |  | 1 |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  | 1 |  | 1 |  |  |  | |  |  | 1 |  | 2 |  | 1 |  |  | |  | 1 |  | 3 |  | 3 |  | 1 |  | | 1 |  | 4 |  | 6 |  | 4 |  | 1 | |
|  | **Develop** a program using function to calculate the simple interest. Suppose the customer is a senior citizen. He is being offered 12 percent rate of interest; for all other customers, the ROI is 10 percent.  **Sample Input:**  Enter the principal amount: 200000  Enter the no of years: 3  Is customer senior citizen (y/n): n  **Sample Output:**  Interest: 60000 |
|  | **Build** a class **series** and use **member function input()** for getting a number and **member function show()** to print fibonacci series of a number. |
|  | **Develop** a program to print the below pattern  1  2 2  3 3 3  4 4 4 4 |
|  | **Build** a C++ program to print the below pattern  1  2 2  3 3 3  4 4 4 4  3 3 3  2 2  1 |
|  | **Develop** a C++ program to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial).  Compute the bill amount using the following tariff. If the type of the EB connection is domestic,  calculate the amount to be paid as follows:  First 100 units - Rs. 1 per unit  101-200 units - Rs. 2.50 per unit  201 -500 units - Rs. 4 per unit  > 501 units - Rs. 6 per unit  If the type of the EB connection is commercial, calculate the amount to be paid as follows:  First 100 units - Rs. 2 per unit  101-200 units - Rs. 4.50 per unit  201 -500 units - Rs. 6 per unit  > 501 units - Rs. 7 per unit |
|  | **Develop** a C++ program to perform different arithmetic operations such as addition, subtraction, division, modulus and multiplication switch case |
|  | **Develop** a Employee class with Emp\_name, Emp\_id, Address, Mail\_id, Mobile\_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary. |
|  | **Develop**  a class in C++ program To compute a record of 10 students, Read the name, Regno ,mark1,mark2,mark3 of the student, calculate the average marks and grade for to display it.  Test Case Average >90 , Grade – S  Average >80 , Grade A  Average >70, Grade C  Average >60 Grade D  Average >50 Grade E  Average less than 50 Grade F |
|  | **Develop** a Program in C++ to calculate income tax for the employee based on the following condition  1. if taxableincome<=60000,  tax=0;  2. if taxableincome >60000 and taxableincome <=150000,    tax= taxableincome \*0.05;  3.if taxableincome >150000 or taxableincome <=500000)  tax= taxableincome \*0.1;      else  tax=tableinc\*0.15; |

**DAY 2 - LAB QUESTIONS**

1. Write a C++ program to print the given number in reverse order. Use functions with return type and without return type for reversing the number
2. Write a program in C++ to calculate the area of circle, rectangle, square and triangle using function overloading.
3. Write a C++ program to perform different arithmetic operations such as addition, subtraction, division, modulus and multiplication using inline functions.
4. Write a C++ program to swap two number using call by value mechanism
5. Create a class *Vector* with *a single dimensional array*, and *size* as data members. Use friend functions to read and print the member values. Write a main method to demonstrate the *Vector* class.
6. Create a class *Employee* with members *empno , name , deptname* and *designation* as private variables. Create a friend function *List Dept Wise* to list all employees for a given dept.
7. Write a program to find whether the person is eligible for vote or not. And if that particular person is not eligible, then print how many years are left to be eligible. (day 2)

Sample Input:

Enter your age:

7

Sample output:

You are allowed to vote after 11 years

Test cases:

1. 25
2. Eighteen
3. 12
4. -18
5. 34.5

7. Write a program to print Right Triangle Star Pattern(Day 2)

Sample Input:: n = 5

Output:

\*

\* \*

\* \* \*

\* \* \* \*

\* \* \* \* \*

8. Write a program to convert Decimal number equivalent to Binary number and octal numbers?

Sample Input:

Decimal Number: 15

Sample Output:

Binary Number = 1111

Octal = 17

Test cases:

1. 111
2. 15.2
3. 0
4. B12
5. 1A.2

9. Write a program using function to calculate the simple interest. Suppose the customer is a senior citizen. He is being offered 12 percent rate of interest; for all other customers, the ROI is 10 percent.

Sample Input:

Enter the principal amount: 200000

Enter the no of years: 3

Is customer senior citizen (y/n): n

Sample Output:

Interest: 60000

Test Cases:

1. Principal: 2000 , Years: 0
2. Principal: 20000 , Years: -2
3. Principal: -2000 , Years: 2
4. Principal: 2 , Years: 2000
5. Principal: 0 , Years: 5

10. Write a program to print hollow square and full square symbol pattern? Get the different symbol for hollow square and full square as input from the user.

11. [Program to Find Even Sum of Fibonacci Series Till number N](https://www.geeksforgeeks.org/java-program-to-find-sum-of-fibonacci-series-numbers-of-first-n-even-indexes/)?(day 2)

Sample Input: n = 4

Sample Output: 33

(N = 4, So here the fibonacci series will be produced from 0th term till 8th term: 0, 1, 1, 2, 3, 5, 8, 13, 21

Sum of numbers at even indexes = 0 + 1 + 3 + 8 + 21 = 33)

12. Write a program to enter the marks of a student in four subjects. Then calculate the total and aggregate, display the grade obtained by the student. If the student scores an aggregate greater than 75%, then the grade is Distinction. If aggregate is 60>= and <75, then the grade is First Division. If aggregate is 50 >= and <60, then the grade is Second Division. If aggregate is 40>= and <50, then the grade is Third Division. Else the grade is Fail.

Sample Input & Output:

Enter the marks in python: 90

Enter the marks in c programming: 91

Enter the marks in Mathematics: 92

Enter the marks in Physics: 93

Total= 366

Aggregate = 91.5

DISTINCTION

Test cases:

1. 18, 76,93,65
2. 73,78,79,75
3. 98,106,120,95
4. 96,73, -85,95
5. 78,59.8,76,79

13. Write a program for matrix addition?

Sample Input:

Mat1 = 1 2

5 3

Mat2 = 2 3

4 1

Sample Output:

Mat Sum = 3 5

9 4

14. Write a program for matrix multiplication?

Sample Input:

Mat1 = 1 2

5 3

Mat2 = 2 3

4 1

Sample Output:

Mat Sum = 10 5

22 18

15. Program to remove duplicates from the sorted array (Day 2)

Sample Input:

Array = {15, 14, 25, 14, 32, 14, 31}

Sample Output:

Sorted Array = {14, 15, 25, 31, 32}

Test cases:

1. {16, 16, 16 16, 16}
2. {0, 0, 0, 0}
3. {-12, -78, -35, -42}
4. {1,2,3,7,8,9,4,5,6}
5. {1-2,2-3,3-4,4-5,5-6}

**DAY - 3 - Practice Programs**

1. Read the salary and deductions from user and calculate the Gross Pay, net salary and income tax with various income tax slabs. The salary class will read all details then the deduction class and incometax class will inherit the salary class to perform the above.
2. Implement a program of maintaining banking account information system using multiple inheritance in C++ Programming. Here class savings derived from class account and class user. Use appropriate functions and variables.
3. Consider an example of declaring the examination result. Design 3 classes student,exam,result. The student class has data members such as that representing number, name of student ,create the class exam,which contains data members representing name of subject,minimum marks,maximum marks, obtained marks for 3 subjects derive class result from both student and exam classes. Test the result class in main function ?
4. Find the max of an integral data set. The program will ask the user to input the number of data values in the set and each value. The program prints on screen a pointer that points to the max value.
5. The user enters integers as inputs to be stored in the variables 'a' and 'b' respectively. There are also two integer pointers named ptrA and ptrB. Assign the values of 'a' and 'b' to ptrA and ptrB respectively, and display them.
6. Program to read and display the Names, Roll No., Marks and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of objects to read and display the contents.
7. Count the number of persons inside a bank, by increasing count whenever a person enters a bank, using an increment(++) operator overloading function, and decrease the count whenever a person leaves the bank using a decrement(--) operator overloading function inside a class.
8. Suppose you have a Piggie Bank with an initial amount of Rs.500 and you have to add some more amount to it. Create a class 'AddAmount' with a data member named 'amount' with an initial value of Rs.500. Now make two constructors of this class as follows:  
   i - without any parameter - no amount will be added to the Piggie Bank  
   ii - having a parameter which is the amount that will be added to the Piggie Bank  
   Create an object of the 'AddAmount' class and display the final amount in the Piggie Bank.
9. Write a program to print the below pattern?

|  |  |  |  | 1 |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 1 |  | 1 |  |  |  |
|  |  | 1 |  | 2 |  | 1 |  |  |
|  | 1 |  | 3 |  | 3 |  | 1 |  |
| 1 |  | 4 |  | 6 |  | 4 |  | 1 |

1. Write a program to print the first n perfect numbers. (Hint Perfect number means a positive integer that is equal to the sum of its proper divisors)

Sample Input:

N = 3

Sample Output:

First 3 perfect numbers are: 6 , 28 , 496

Test Cases:

1. N = 0
2. N = 5
3. N = -2
4. N = -5
5. N = 0.2
6. Write a program to print all the composite numbers between a and b?

Sample Input:

A = 12

B = 19

Sample Output

14, 15, 16, 18

Test cases:

1. A = 11, B = 11
2. A = 20, B = 10
3. A = 0, B = 0
4. A = -5, B = 5
5. A = 7, B = -12
6. Write a program to read the numbers until -1 is encountered. Find the average of positive numbers and negative numbers entered by user.

Sample Input:

Enter -1 to exit…

Enter the number: 7

Enter the number: -2

Enter the number: 9

Enter the number: -8

Enter the number: -6

Enter the number: -4

Enter the number: 10

Enter the number:  -1

Sample Output:

The average of negative numbers is: -5.0

The average of positive numbers is : 8.66666667

Test cases:

1. -1,43, -87, -29, 1, -9
2. 73, 7-6,2,10,28,-1
3. -5, -9, -46,2,5,0
4. 9, 11, -5, 6, 0,-1
5. -1,-1,-1,-1,-1

13. Find the Mean, Median, Mode of the array of numbers? (DAY-3)

Sample Input;:

Array of elements = {16, 18, 27, 16, 23, 21, 19}

Sample Output:  
 Mean = 20

Median = 19

Mode = 16

Test cases:

1. Array of elements = {26, 28, 37, 26, 33, 31, 29}

2. Array of elements = {1.6, 1.8, 2.7, 1.6, 2.3, 2.1, .19}

3. Array of elements = {0, 160, 180, 270, 160, 230, 210, 190, 0}

4. Array of elements = {200, 180, 180, 270, 160, 270, 270, 190, 200}

5. Array of elements = {100, 100, 100, 100, 100, 100, 100, 100, 100}

14. Find the number of factors for the given number (DAY-3)

Sample Input:

Given number: 100

Sample Output:

Number of factors = 9

Test cases:

1. 343
2. 1080
3. -243
4. 101010
5. 0

15. Write a program to check if a given year is leap year or not. If it is leap year then print the next leap year, if it is non-leap year then print the previous leap year.

Sample Input:

Enter Date : 1947

Sample Output:

Given year is Non Leap Year

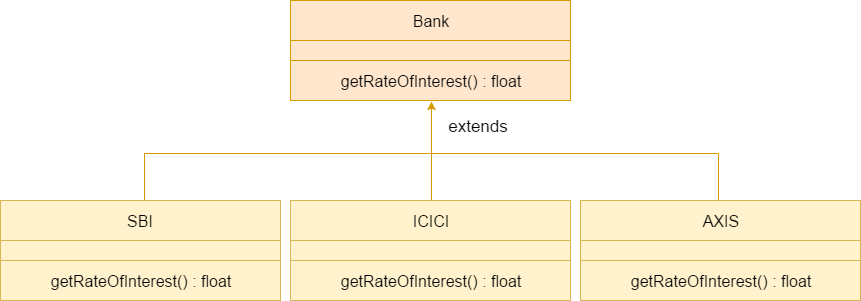
Previous Leap Year: 1944

Test cases:

1. 19.47
2. 1936
3. 0
4. 2000
5. -1428

**DAY - 4 - Practice Programs**

1. Write a program to calculate bonus of the employees. The class master derives the information from both admin and account classes which derives information from class person. Create base and all derived classes having same member functions and different parameters called getdata, display data and bonus. Create a base class pointer that capable of accessing data of any class and calculates bonus of the specified employee.
2. Write a C++ program to calculate the gross and net pay of employee from basic salary. Create employee which consists of employee name,emp\_id, and basic salary as its data members. Use parameterized constructions in the derived class to initialize data members of the base class and calculate gross and net pay of the employee in the derived class.
3. Write a C++ program to demonstrate the multiple inheritance by creating a class cuboid which extends class rectangle, class shape. It calculates area and volume.
4. Write a C++ program to demonstrate multiple inheritance by creating a class cuboid which extends class rectangle, class shape. It calculates area and volume. Use appropriate constructors and member variables.
5. Write Down The Code For Following Diagram Using Inheritance



1. Write a program to print the numbers from M to N by skipping K numbers in between?

Sample Input:

M = 50

N = 100

K = 7

Sample Output:

50, 58, 66, 74, …..

Test cases:

* M = 15, N  = 05, K = 02
* M = 25, N  = 50, K = 04
* M = 15, N  = 100, K = -02
* M = 0 , N = 0 , K = 2
* M = 200 , N = 200 , K = 50

1. Write a program for matrix addition?

Sample Input:

Mat1 = 1  2

5  3

Mat2 = 2   3

4   1

Sample Output:

Mat Sum = 3    5

9    4

1. Write a program to print rectangle symbol pattern. Get the symbol as input from user
2. Write a program to calculate tax given the following conditions:

If income is less than or equal to 1,50,000 then no tax

If taxable income is 1,50,001 – 3,00,000 the charge 10% tax

If taxable income is 3,00,001 – 5,00,000 the charge 20% tax

If taxable income is above 5,00,001 then charge 30% tax

Sample Input:

Enter the income:200000

Sample Output:

Tax= 20000

Test cases:

* 400700
* 2789239
* 150000
* 00000
* -125486

1. Write a program that would sort a list of names in alphabetical order Ascending or Descending, choice get from the user?

Sample Input:

Banana

Carrot

Radish

Apple

Jack

Order(A/D) : A

Sample Output:

Apple

Banana

Carrot

Jack

Radish

1. Write a program to enter the marks of a student in four subjects. Then calculate the total and aggregate, display the grade obtained by the student. If the student scores an aggregate greater than 75%, then the grade is Distinction. If aggregate is 60>= and <75, then the grade is First Division. If aggregate is 50 >= and <60, then the grade is Second Division. If aggregate is 40>= and <50, then the grade is Third Division. Else the grade is Fail.

Sample Input & Output:

Enter the marks in python: 90

Enter the marks in c programming: 91

Enter the marks in Mathematics: 92

Enter the marks in Physics: 93

Total= 366

Aggregate = 91.5

DISTINCTION

Test cases:

* 18, 76,93,65
* 73,78,79,75
* 98,106,120,95
* 96,73, -85,95
* 78,59.8,76,79

1. Find the factorial of n?

Sample Input:

N = 4

Sample Output:

4 Factorial = 24

Test cases:

* N = 0
* N = -5
* N = 1
* N = Q
* N = 3A

1. Write a Program to create a list of all numbers in a range which are perfect squares and the sum of the digits of the number is less than 10.

Sample Input & Output:

Enter lower range: 1

Enter upper range: 40

[1, 4, 9, 16, 25, 36]

Test case:

* Enter lower range: 50

Enter upper range: 100

* Enter lower range: 5

Enter upper range: 8

* Enter lower range: 10

Enter upper range: 5

* Enter lower range: 500

Enter upper range: 500

* Enter lower range: 0

Enter upper range: -100

1. Write a Program to Find the Nth Largest Number in a array.

Sample Input:

List  : {14, 67, 48, 23, 5, 62}

N = 4

Sample Output:

Largest number: 23

Test cases:

* N = 0
* N = -5
* N = 1
* N = M
* N = %

1. Find the maximum of three integers using looping.

Sample Input:

Given Numbers: 1101, 1011, 1001

Sample Output:

Maximum Number: 1101

1. Write a program to find the sum of digits of N digit number (sum should be single digit)

Sample Input:

Enter N value : 3

Enter 3 digit number: 143

Sample Output:

Sum of  3 digit number: 8

Test cases:

* N = 2, 158
* N = 3, 14
* N = 4, 0148
* N = 1, 0004
* N = 4, 7263

Day 5 Practice Programs

1. ***Problem Statement:*** The packing department of a television vision set manufacturer has to prepare a requisition note listing the number of different boxes required for the different TV models that it has received from the production department. The list prepared has to be forwarded to the stores department so that the required boxes are issued to the packing department. The category and the number of boxes required for each type of TV model is given as follows: Model types are TV-LCD 17,22,26,32,37 and box types are 1,2,3,4,2 respectively.

Analysis:

**Output**

prepare a requisition note include TV model, box types, number of different boxes required

**Input:** number of different boxes required for the different TV models

2. ***Problem Statement*** : While purchasing certain items, a discount of 10% is offered if the quantity purchased is more than 1000. If quantity and price per item are input through the keyboard, write a program to calculate the total expenses.

3.Write a source code for banking system with account creation with minimum 500 INR, deposit, withdraw, and balance checking features for 20 holders. Here 500 INR minimum balance should be maintain by all account holders.

4***. Problem Statement*** :A Travels company insures its drivers in the following cases:

* Driver is married.
* Driver is an unmarried male above 30 years of age.
* Driver is an unmarried female above 25 years of age.

In all other cases the driver is not insured. If the marital status, gender and age of the driver are the inputs, write a program to determine whether the driver is to be insured or not.

5. ***Problem Statement*** :You are playing an online game. In the game, a list of N numbers is given. The player has to arrange the numbers so that all the odd numbers of the list come after the even numbers. Write an algorithm to arrange the given list such that all the odd numbers of the list come after the even numbers.

**Input**

The first line of the input consists of an integer num, representing the size of the list(N). The second line of the input consists of N space-separated integers representing the values of the list

**Output**

Print N space-separated integers such that all the odd numbers of the list come after the even numbers

6. ***Problem Statement*** :A digital machine generates binary data which consists of a string of 0s and 1s. A maximum signal M, in the data, consists of the maximum number of either 1s or 0s appearing consecutively in the data but M can’t be at the beginning or end of the string. Design a way to find the length of the maximum signal.

**Input**

The first line of the input consists of an integer N, representing the length of the binary string. The second line consists of a string of length N consisting of 0s and 1s only.

**Output**

Print an integer representing the length of the maximum signal.

7. ***Problem Statement*** :Given an integer matrix of size N x N. Traverse it in a spiral form.

Format:

**Input:**

The first line contains N, which represents the number of rows and columns of a matrix. The next N lines contain N values, each representing the values of the matrix.

**Output:**

A single line containing integers with space, representing the desired traversal.

Constraints: 0 < N < 500

8. ***Problem Statement :***

Write a program to print all the locations at which a particular element

(taken as input) is found in a list and also print the total number of times it occurs

in the list. The location starts from 1.

For example if there are 4 elements in the array

5

6

5

7

If the element to search is 5 then the output will be

5 is present at location 1

5 is present at location 3

5 is present 2 times in the array.

***9. Problem Statement :***

Write a program to print the below pattern

1

8 27

64 125 216

343 512 729 1000

10. ***Problem Statement :*** A child is running up a staircase with n steps and can hop either 1 step, 2 steps, or 3 steps at a time. Implement a method to count how many possible ways the child can run up the stairs.  
Examples:

**Input : 4**

**Output : 7**

***11. Problem Statement :***There are two banks – Bank A and Bank B. Their interest rates vary. You have received offers from both banks in terms of the annual rate of interest, tenure, and variations of the rate of interest over the entire tenure. You have to choose the offer which costs you least interest and reject the other. Do the computation and make a wise choice.

The loan repayment happens at a monthly frequency and Equated Monthly Installment (EMI) is calculated using the formula given below :

EMI = loanAmount \* monthlyInterestRate / ( 1 – 1 / (1 + monthlyInterestRate)^(numberOfYears \* 12))

**Constraints:**

* 1 <= P <= 1000000
* 1 <=T <= 50
* 1<= N1 <= 30
* 1<= N2 <= 30

**Input Format:**

* First line: P principal (Loan Amount)
* Second line: T Total Tenure (in years).
* Third Line: N1 is the number of slabs of interest rates for a given period by Bank A. First slab starts from the first year and the second slab starts from the end of the first slab and so on.
* Next N1 line will contain the interest rate and their period.
* After N1 lines we will receive N2 viz. the number of slabs offered by the second bank.
* Next N2 lines are the number of slabs of interest rates for a given period by Bank B. The first slab starts from the first year and the second slab starts from the end of the first slab and so on.
* The period and rate will be delimited by single white space.

**Output Format:**Your decision either Bank A or Bank B.

12. Write a program to print number of factors and to print nth factor of the given number.

Sample Input:

Given Number: 100

N = 4

Sample Output:

Number of factors = 9

4th factor of 100 = 5

Test Cases:

1. Given Number = 512 , N = 6
2. Given Number = 343 , N = 7

13.Write a Program to Remove the Duplicate Items from a array.

Sample Input:

Enter the number of elements in array:7

Enter element1:10

Enter element2:20

Enter element3:20

Enter element4:30

Enter element5:40

Enter element6:40

Enter element7:50

Sample Output:

Non-duplicate items:

[10, 20, 30, 40, 50]

14. Program to find whether the given number is Armstrong number or not

Sample Input:

Enter number : 153

Sample Output:

Given number is Armstrong number

Test cases:

1. 370
2. 1
3. 371
4. 145678
5. 0.21345

15. compute the salary calculation as per the following table:

